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Title: VALVE TIMING CONTROL SYSTEM FOR INTERNAL  
COMBUSTION ENGINES

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Abstract

(Object)

To provide a variable control system for internal combustion engines, which can provide a high response to adjust a relative phase angle between the rotating member and the camshaft, by raising speed to move the phase-angle adjusting mechanism.

(Constitution)

A variable valve timing control system for an internal combustion engine comprises the ring gear mechanism 12 (phase-angle adjusting mechanism) for adjusting a relative phase angle between the timing belt pulley 7 (rotating member) and the camshaft 1, the drive mechanism 17 for drivingly controlling said ring gear mechanism 12 via fluid pressure from the pressure chamber 18 created by the main oil pump 30 arranged in the hydraulic circuit 19. The drive mechanism 17 includes the subsidiary oil pump 31 being arranged in said hydraulic circuit 19 in parallel with or in series to said main oil pump 30 and switching means 34 for introducing one of a working fluid discharged from said main oil pump 30 and a working fluid discharged from said subsidiary oil pump 31, depending on the operation state of the engine.

Utility model registration claim:

1. A variable valve timing control system for an internal combustion engine comprising:

an engine synchronous rotating member having a driven connection with an engine crankshaft;

a camshaft receiving torque transmitted from said rotating member for opening and closing a valve;

a phase-angle adjusting mechanism for adjusting a relative phase angle between said rotating member and said camshaft;

a drive mechanism for drivingly controlling said phase-angle adjusting mechanism via fluid pressure created by a main oil pump arranged in a hydraulic circuit, depending upon the operating state of said engine; characterized by

said drive mechanism including a subsidiary oil pump being arranged in said hydraulic circuit in parallel with said main oil pump, for maintaining said fluid pressure at a designated high level during low engine speed and high engine load, and switching means for introducing one of a working fluid discharged from said main oil pump and a working fluid discharged from said subsidiary oil pump, into said phase-angle adjusting mechanism.

2. A variable valve timing control system for an internal combustion engine comprising:

an engine synchronous rotating member having a driven connection with an engine crankshaft;

a camshaft receiving torque transmitted from said rotating member for opening and closing an valve;

a phase-angle adjusting mechanism for adjusting a relative phase angle between said rotating member and said camshaft;

a drive mechanism for drivingly controlling said phase-angle adjusting mechanism via fluid pressure created by a main oil pump arranged in a hydraulic circuit employed in said engine, depending on the operating state of said engine; characterized by

said drive mechanism including a subsidiary oil pump being arranged in said hydraulic circuit in series to said main oil pump, for enhancing a pressure of working fluid discharged from said main oil pump

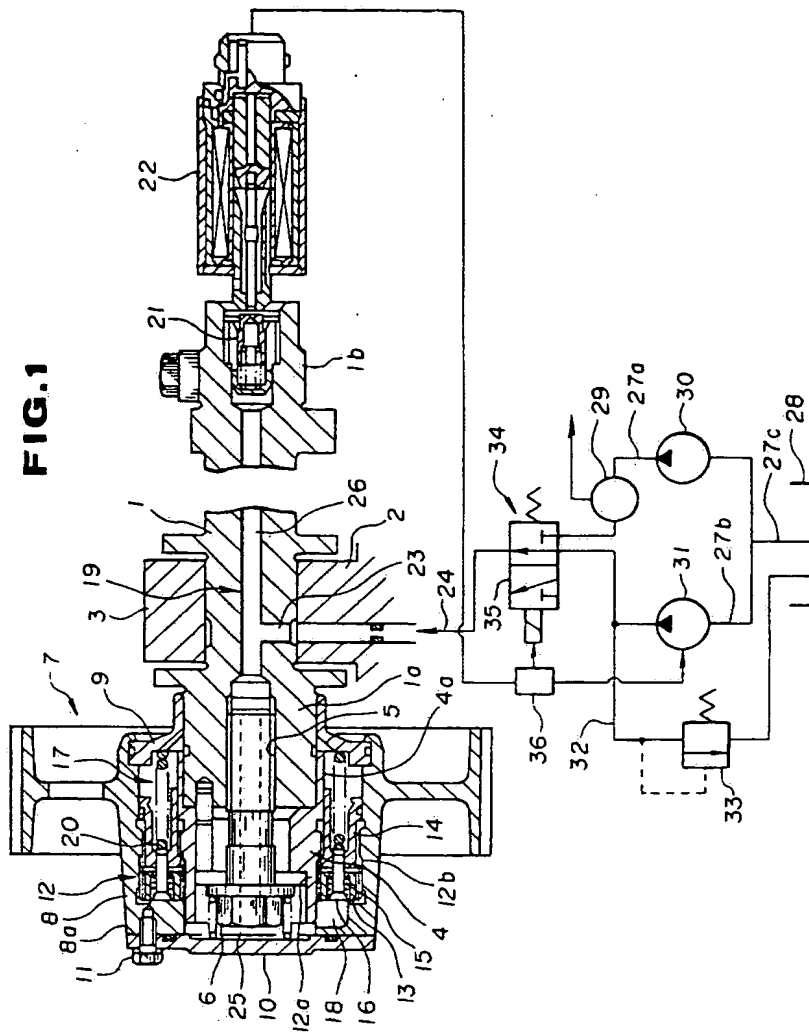
#### Brief description of the drawings

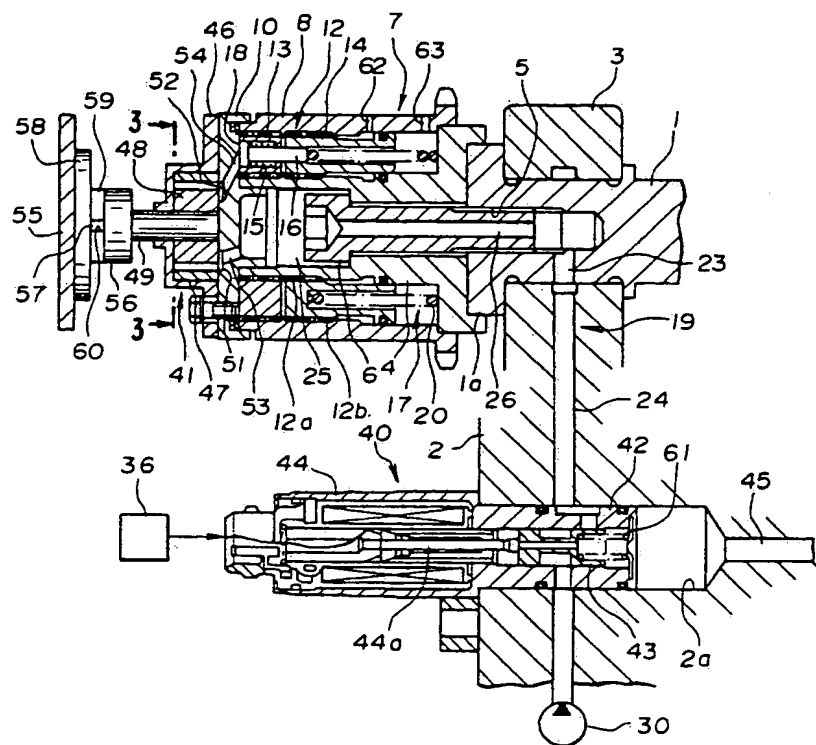
FIG. 1 is a longitudinal cross-sectional view illustrating claim 1 of a valve timing control system for internal combustion engines according to the invention.

FIG. 2 is a longitudinal cross-sectional view illustrating claim 2 of a valve timing control system for internal combustion engines according to the invention.

FIG. 3 is a lateral cross-sectional view taken along of line A-A of FIG. 2.

1 --- camshaft, 7 --- timing belt pulley (rotating member), 12 --- ring gear mechanism (phase-angle adjusting mechanism), 17 --- drive mechanism, 19 --- hydraulic circuit, 30 --- main oil pump, 31, 41 --- subsidiary oil pump, 34 --- switching means



**FIG. 2****FIG. 3**